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ABSTRACT

The environment lesson plans in this packet are designed to take an in-depth look at different components of the environment. The plans were developed with the assistance of specialists in educational processes and educators, students, and resource-agency people for whom they are designed. They have been field-tested in environmental education workshops throughout the country. The lessons provide a structure for learning in which an activity builds on others and leads to generalizations about the environment. They also are designed to elicit a maximum of student response and involvement through the use of discussions and question techniques. In many instances charts, tables, and other aids are included to help the student interpret the data he has collected. The titles of the lessons are: Investigations of Land Use Planning; Measuring Some Water Quality Criteria; Investigating Envrionmental Habitats; Interpreting the Landscape in a Forest Environment; Land Use Simulation Game; Comparing Two Environments; and Investigating an Urban Environment. (JP)

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TEACHING MATERIALS FOR ENVIRONMENTAL EDUCATION

Investigating Your Environment

Forest Service, U.S. Department of Agriculture
July 1973

SE 016 922

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TEACHING MATERIALS FOR ENVIRONMENTAL EDUCATION

Investigating Your Environment

INTRODUCTION

The environmental investigation lesson plans in this packet are designed to help "teachers" take an in-depth look at different components of the environment. The plans were developed with the assistance of specialists in educational processes and educators, students, and resource-agency people for whom they are designed. They have been field-tested in environmental education workshops throughout the country.

The lesson plans provide a structure for learning in which one activity builds on others and leads to some generalizations about the environment. These generalizations, in turn, can provide a basis for a better understanding of environmental problems and their possible solutions. Even though the investigations are "structured," they allow the student freedom to observe, collect, record, and interpret data at his own pace and level of understanding. The lessons also are designed to elicit a maximum of student response and involvement through the use of discussions and questioning techniques. In many instances, charts, tables, and other aids are included to help the student interpret the data he has collected.

The techniques used in these investigations, such as collecting observable data, making inferences, setting up investigations to check inferences, communicating feelings and awareness, can be replicated and used in investigating other problems and other components of the environment. However, the activities used are not all replicable, and the teacher will need to develop activities appropriate to new situations.

LESSON PLAN COMPONENTS

Each investigation contains suggestions for "setting the stage," a series of tasks to be done individually or in small groups, task card samples to be used with these activities, summary activities and questions, supplementary charts and tables where appropriate, and, in some instances, additional information about the type of teaching activity to be used.

Processes

The educational processes of (1) collecting data from primary sources, rather than from books or lectures, and (2) of group problem solving, have proved to be particularly useful in environmental education. Evaluations from workshops indicate that these processes facilitate an understanding of environmental interactions and interdependence, as well as a development of concepts by the learners about the environment. These two basic processes or approaches are used throughout the investigations.

Self-Directed Task Cards

Task cards, which have been developed for most of the activities, appear in the appropriate place in each lesson. Some of them represent activities which can be used separately from the rest of the lesson. In all cases, it is recommended that the task cards be separated from the rest of the lesson plan and be given to students as they are needed.

Discussion Questions

Discussion questions are used to introduce and to summarize each activity or task. Such questions immediately involve the student in a way that lectures or instructions from the teacher do not. Dis-

cussion questions are open-ended in that more response than yes or no is required. The learner has the opportunity to contribute the data he has collected as well as his thoughts about that information.

The summarization of tasks and lessons which also uses questions and discussion is one of the most important parts of each investigation. The questions used are designed to:

1. Provide opportunities to discuss the implications of what has been learned about the environment for management of the environment.
2. Assist the participant in developing his own concepts and generalizations about what he has done and the ways in which he has learned.

Behavioral Outcomes

Since educators now prefer to evaluate learning experiences in terms of the subsequent observable behavior of students, some minimal expectations concerning the acquisition of knowledge and skills have been described. Possible behavioral outcomes in the areas of environmental feelings, awareness, values, and action are also listed.

CONDUCTING THE INVESTIGATIONS

The following guidelines may help in conducting the environmental investigations in this packet. They are not "sure fire," of course, and may require some adaptation in different situations. They take into consideration some of the stumbling blocks that can interfere with the student's fullest involvement in learning activities.

1. Minimize as fully as possible the amount of lecturing, showing, or telling.
2. Go over the objectives of the investigation, briefly, with the students so they will know what to expect.
3. Do a preview by yourself of the investigation in the place where it is to be conducted.
4. Plan and pace the session so that each task can be done thoroughly and well.
5. If there are time restrictions that prevent doing an entire investigation, decide in advance which tasks are to be omitted. Don't get trapped into rushing so much that you provide all the data verbally instead of allowing students to collect it.
6. Use the lesson plans as a guide, particularly for the questioning and discussion periods, but don't hesitate to revise as necessary once the plan has become familiar.
7. Start the summarization of the investigation at least a half hour before the time period ends. Since these summaries deal with the ways that what is learned in the investigations can be applied to land management and environmental problems, they are extremely important and should be given ample time.
8. Use the summarizations as evaluation tools. The discussion that concludes each session will reveal what concepts and understandings have been acquired by students and what additional information they may need.
9. Include a discussion of ways the investigation can be used in classrooms or on schoolgrounds, especially giving consideration to ways environmental studies can be integrated with other subject areas of the school curriculum.
10. Do a self-evaluation of the session while it is still fresh in mind so that improvements can be made for later sessions.

Moving people from place to place and having enough equipment may not be the most important things in an instructional activity; however, too little attention to these can detract from the success of the instruction, so consider the following:

1. Make sure that you have enough equipment and that it is in working order.
2. Plan for checking out and returning the equipment. It is usually best to assign a student to this job.
3. Discuss possible hazards, "rules of the road," and sanitary provisions with the students before leaving for the study area.

CONCLUSION

The ideas and activities in these teaching materials will not "come to life" until you have tried them, modified them, and improved them to fit your own needs and the location. Every teacher has a special style of his own, and he should use the lesson plans to fit that personal style.

Additional lesson plans for investigating other elements of the environment are being developed and will be added to the packet from time to time. If you wish to receive these as they become available, send your name to:

U.S. Department of Agriculture
Forest Service
Environmental Education Branch
Washington, D.C. 20250

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A LESSON PLAN FOR SOME INVESTIGATIONS FOR LAND USE PLANNING

Set the stage for this investigation by reviewing quickly what will take place in the allotted time. For example: "In the next 4 hours we will develop some skills and apply them to collecting and interpreting data about the soil environment and then apply that data to making some decisions about what the best uses of this land might be." You might want to read the behavioral objectives which appear at the end of this lesson plan and refer back to them as an evaluation of the session.

I. DESCRIBING SOIL

When you first meet the group, have them sit down and do Task A:

TASK A: (5 minutes) Work by yourself.

Describe in writing your own description of soil. Keep this description for your own reference at the end of the session.

II. OBSERVING AND RECORDING THINGS IN THE SOIL

Distribute Task B cards and have class work in groups of 3 or 4 and report findings in 15 minutes.

Task B: (15 minutes) Work in small groups.

1. Predict what things you will find in the top few inches of this forest floor. List your predictions:

2. Stake out an area 2 or 3 feet square on the forest floor and sift through the top 3 inches of the soil, recording the evidence of plant and animals you observe.

Name or Description of Item in the Soil	*Quantity*	*Possible Effect on Soil*

TASK B—Continued

3. The following three terms are used to describe organic matter at the top of the soil: *litter, duff, humus.* From your study above, complete the following chart:

Term and definition	*Describe the feel*	*List the identifiable parts of plants and animals you found*
Litter (identifiable dead things on surface)		
Duff (partially decomposed organic matter comparted)		
Humus (almost completely decomposed non-identifiable organic matter)		

Questions and discussion:

1. What did you find?
2. When would you expect to find more organisms? different organisms?
3. How do the organisms you found benefit the soil?
4. What are some reasons for odors in the soil?

III. DEVELOPING THE SKILLS TO COLLECT SOIL DATA

Move the group to the soil profile or soil pit.

Questions and discussion:

1. What can we see as we look at this cross section or profile of soil?
2. What are some things that would be important to find out about it? Accept all comments. The observable characteristics of color, texture, structure, temperature and the acidity or alkalinity (pH) of a soil are indications of some soil conditions important in land use planning.
3. We are going to collect and record some of this information. For the next few minutes, we will stay together as a group to develop skills in collecting soil data. After that, you will be working on your own.

Quickly (10 min.) go over the following items about soil and collecting the data. This instructional session is extremely important. The participants will use the skills they develop in this session when they collect data for the mirromonolith.

Soil Components (not necessary to discuss in this order)

1. *Soil layers* (Horizons)

   Mark where the soil changes color and general appearance. Many soils have 3 major layers or horizons; *i.e.*, top soil, subsoil and parent material; Because soil formation has many variables, you may find more or less. Measure and record the depth of each major layer.

2. *Color*

   Describe and record the color of each major layer. Have participants pick their own description of color.

3. *Texture* (How the soil feels)

Determine and record the texture of each major layer.

Texture is determined by feel. Push and rub moistened sample between thumb and forefinger. Spit on sample to moisten.

If it feels gritty	sand
If it feels smooth and slick, not very sticky	silt
If it feels smooth, plastic, *very* sticky	clay

Note: Have samples of sand, silt, clay in cans. Have participants practice with these samples to find out what the textures feel like before determining textures of the soil profile under study.

4. *Structure* (How the soil is put together)

Determine the structure of each major layer. Carefully break apart a shovelful of soil from each layer and match its characteristics with one of the structure words on the work card. (Task C)

5. *Temperature*

Determine and record the temperature of each layer. Plant's growth depends upon soil temperatures during the *growing season*. Find out growing season in the study area in advance.

6. *pH (acidity or alkalinity)*

Determine and record the pH of each major layer. Plants need many soil nutrients to grow well. The degree of pH also affects how plants grow.

Note to instructor: Demonstrate how to use pH kit in front of whole group. Use some foreign material like cigar ashes as a demonstration. Mention not to compact the sample in the porcelain dish. Use just enough pH reagent to saturate soil sample. Match color at the edge of the soil sample in porcelain dish with pH color chart.

IV. CONSTRUCTING A SOIL MICROMONOLITH

Explain that the skills just developed are going to be used to construct a soil micromonolith. Explain that a micromonolith is a small cross section of the soil profile. You can make one by just sketching the layers on the profile sketch, or putting samples of each layer in a baby food jar or other clear container. Distribute Task C cards. Notice there is a place to check or record the data collected and a place to sketch what the soil looks like.

TASK C: (20-30 minutes) Work in small groups or by yourself.

Using the skills you have just developed, and the available equipment, construct a soil micromonolith of this soil profile. Record your observations on the soil micromonolith lab sheet. You may want to make a micromonolith using the cards and jelly cups; if so, ask your instructor.

When finished with this task, report to the instructor to receive TASK D.

Air temperature 3 feet above soil surface	
Air temperature just above soil surface	

Sketch your soil profile, label the layers or horizons and record the data.

PROFILE SKETCH

DATA

Contents of material above soil: _____
_____. Depth _____" to _____".

A. (Horizon): Depth _____" to _____". Color _____
Topsoil
Texture: Sand _____, Silt _____, Clay _____
Structure: Columns _____, Blocky _____, Platey _____,
Granules _____, pH _____, Temp. _____, _____°F. Plant
Roots Visible _____.

Record below the same information above for the rest of the layers.

Describe type of rock in the bedrock (if present) _____
_____
_____
_____

V. ANALYZING YOUR SOIL DATA

TASK D: (20–30 minutes) Work in small groups or by yourself.

Using the soil data you collected and the following tables answer the following questions:

Effect of Soil Depth on Plant Growth and Water Storage

Deep Soil (over 42")	Excellent water storage and plant growth
Mod. Deep Soil (20"–42")	Good water storage and plant growth
Shallow Soil (20" & under)	Poor water storage and plant growth

The potential of my soil for water storage and plant growth is:
excellent_____ good_____ poor_____
Why? _____

Task D:—Continued

SOME RELATIONSHIP OF COLOR TO SOIL CONDITIONS

Top soil condition	*Dark (dark grey, brown to black)*	*Moderately dark (dark brown to yellow-brown)*	*Light (pale brown, to yellow)*
Amount of organic material	Most	Moderate	Low
Erosion factor	Low	Medium	High
Aeration	Excellent	Good	Low
Available Nitrogen	Excellent	Good	Low
Fertility	Excellent	Good	Low

Subsoil soil color (B horizon)	*Condition*
Dull Grey (if in low rainfall soils)	Water-logged soils, poor aeration
Yellow, red-brown, black (if in forest soils)	Well drained soils
Mottled grey (if in humid soils)	Somewhat poorly to poorly drained soils

a. What can you say about the following, based on the color of the top soil, or A horizon?
amount of organic material _____
erosion factor _____
fertility _____

b. What can you say about the drainage in the B horizon, based on color?

Effect of texture on texture	*Water holding capacity*	*Looseness of soil*
Sand	Poor	Good
Silt	Good to excellent	Good
Clay	High (Plants can't use it in clay.)	Poor

My soil texture	*Soil water-holding capacity*	*Looseness*
Topsoil (A)		
Subsoil (B)		

TASK D—Continued

EFFECTS OF STRUCTURE ON SOIL CONDITIONS

Type	*Penetration of water*	*Drainage*	*Aeration*
Columns	Good	Good vertical	Good
Blocky	Good	Moderate	Moderate
Granular	Good	Best	Best
Platey (like stack of plates)	Moderate	Moderate	Moderate

Using the structures you recorded, and the chart above, what can you say about the drainage properties of your soil for:

Topsoil (A)_____

Subsoil (B)_____

1 4.5 6.5 7 8.5 14

(1 to 4.5 is too acid for most plants) (Most plants do best here) (8.5 to 14 is too alkaline for most plants)

Example of plants in pH range:

pH 4.0–5.0: rhododendrons, camellias, azaleas, blueberries, fern, spruce
pH 5.0–6.0: pines, firs, holly, daphne, spruce, oaks, birch, willow, rhododendron
pH 6.0–7.0: maple, mountain ash, pansy, asters, peaches, carrots, lettuce, pines, firs
pH 7.0–8.0: beech, mock orange, asparagus, sagebrush

Using the pH ranges you recorded and the table above, complete the following chart:

Some plants that could grow here based on the pH and chart	*Some plants actually observed growing here*

Did your inferences about the soil pH-plant relationships check out?

Yes_____ No_____ Explain:_____

Is pH the only factor affecting where plants grow? Yes_____ No_____

Explain: _____

TASK D—Continued

Describe in a short paragraph how you would set up an experiment to collect data and construct your own soil pH-plant relationship chart.

SOIL TEMPERATURE

Soil temperature	*Conditions during growing season*
Less than 40°F	No growth, soil bacteria and fungi not very active
40°F to 65°F	Some growth
65°F to 70°F	Fastest growth
70°F to 85°F	Some growth
Above 85°F	No growth

The growing season for my area is _____

What does the soil temperature chart tell you? _____

_____

In the space below, convert the soil temperature table to a line graph. (5–10 minutes) Work by yourself.

VI. DETERMINING SOME LAND USES

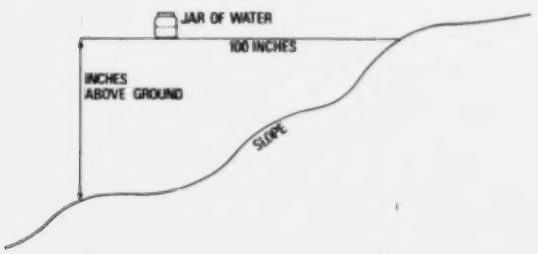
Questions and discussion:

Explain to students that all the information needed, except the slope of the land, to discuss some land uses of the study area has been obtained. Pass out Task E. Demonstrate its use and have students work in small groups to measure other slopes in the study area.

TASK E:

Determining the Slope of the Land:

1. Select a place that represents the average slope of the land being studied or take several measurements and average them.
2. Place one end of a 100″ stick on the slope you want to measure. Hold outright to be about level.
3. Place a level or jar with some liquid in it on the outright stick. Raise or lower the stick until level.
4. Measure the number of inches the free end of the stick is off the ground.
5. The number of inches is the slope of the land in percent.



If you use a different length stick, then correct by using the conversion table below.

CONVERSION TABLE

Length stick used	*No. inches the end of the stick is above the ground*		*Multiply by conversion factor*		*% Land*
100″	_____	×	1	=	
50″	_____	×	2	=	
25″	_____	×	4	=	

LAND USE CHART

This is a chart for soils in one kind of land, climate and plants. Other areas may require a different set of criteria.

Agriculture uses	*Slope*	*Erosion hazard*	*Soil depth*	*Drainage*	*Texture*
Farm crops—cultivation good soil mngmt. practices	0–3	None	Deep	Well drained	Loam or silt loam
Farm crops-few to several special cultivation practices	3–20	Slight to moderate	Mod. deep	Somewhat poorly	Sandy loam or silty clay
Occasional cultivation, many special practices	20–30	Severe	Shallow	Poor	Sand or clay

TASK E:—Continued

LAND USE CHART—Continued

Agriculture uses	*Slope*	*Erosion hazard*	*Soil depth*	*Drainage*	*Texture*
Pasture-woodland cultivation, no machinery can be used	0–2	None to slight	Deep	Well to poor	Stoney
Pasture, timber growing, woodland, wildlife, no cultivation machinery	30–90	Very severe	Deep to shallow	Well to poor	Sandy, silty, claying or rocky
Wildlife, recreation	all	None to extreme	Deep to shallow	Excessive to poor	Rockland, river wash, sand dunes

The most limiting soil factor will determine the best agricultural use of the land.

Occupancy land uses by man

Man's varied uses of land has demanded criteria to determine proper management practices for living on the land. Examples in addition to agricultural uses include: prescriptions for aesthetic management, soil site indexes for growing timber, criteria for greenbelts, etc.

Some uses & factors affecting that use	*Slight limitation*	*Moderate limitation*	*Severe limitation*
Roads and Streets			
Slopes	0–12%	12–30%	Over 30%
Depth	Over 40″	20–40″	Less than 20″
Watertable	Over 20″	10–20″	Less than 10″
Building Sites			
Slopes	0–12%	12–20%	Over 20%
Depth	Over 40″	20–40″	Less than 20″
Watertable	Over 30″	20–30″	Less than 20″
Septic Tank Filter Fields			
Slope	0–7%	7–12%	Over 12%
Depth	Over 6′	4–6′	Less than 4′
Watertable depth below trench	Over 4′	2–4′	Less than 2′
Picnic and Camp Areas			
Slope	0–7%	7–15%	Over 15%
Stones	0–20%	20–50%	Over 50%
Watertable during season of use	Over 30″	20–30″	Less than 20″

Distribute Task F cards.

TASK F: (20 minutes) Work in small groups.

Using the data from Task D, Task E, and the Land Use Chart (preceding page), answer the following questions.

According to the agriculture and occupancy land use charts, this land could be used for:

Agriculture use:
(list & explain why)

Occupancy: (yes or no and with what limitations)

Roads and streets

Building sites

Septic tank filter fields

Picnic and camp areas

I feel the best uses of this land would be: (justify your answer)

Questions and discussion:

1. How have you classified this land?
2. Based on your observations and the data you collected, do you feel this land is being properly used?
3. In your estimation, have man's activities affected the classification of this land?
4. Could man improve the capability of this area? How?
5. How could man reduce the capability of this area?

Distribute Task G cards.

TASK G: (10 minutes) Work by yourself.

Using the words from the data you collected and recorded on the soil micromonolith card, write a description of the soil in your soil study. Compare this description with the one you wrote at the beginning of the session.

Questions and discussion:

1. What are some factors that contribute to soil formation?
2. What evidences of geological changes have you noticed in this area?
3. What other factors might affect uses of the land? (climate, growing season, needs of community, economic, past history of uses, etc.)

VII. COMMUNICATING FEELINGS, AWARENESS, AND VALUES ABOUT SOIL

Distribute Task H cards.

TASK H: (10 minutes)

Describe what you can do to improve the use of the soil: in your backyard, in your community.

Questions and discussion:

Ask for individual descriptions and have group discuss. Relate back to the responses given to questions after TASK F.

What types of community action can we take to identify and help solve soil and land management problems in our community? How do these relate to zoning laws, planning commissions, local and state political discussion-making?

Take these data or processes of collecting data and identify a local land use problem and develop a simulation game similar to the Center Place game. (See Lesson Plan Outline for an Environmental Land Use Simulation Game.)

Summary Questions

1. What did we find out about the environment in our study today?
2. How are soil characteristics important in environmental management?
3. How can we summarize our discussions and investigations?
4. What processes and methods did we use in our investigation today?
5. Let's review the behavioral outcomes for this session to see if we achieved our objectives. Read list and have group comment.

Distribute Task I cards.

TASK I:

Describe in writing how you feel about our session today. (Evaluation)

Behavioral Outcomes in Knowledge

As a result of this session, you should be able to:

Describe three ways in which the living organisms in the top part of the soil affect the soil.
Construct a soil micromonolith of an assigned soil profile, determine and record texture, structure, pH, temperature, and color of each layer.
Write a description of a soil you studied, using the words you recorded about that soil on your micromonolith.
Demonstrate the ability to determine the best uses of the land in this area, using the data from your soil micromonolith and the land capability charts.
Describe three things that man does to determine the proper management of the soil resource.

Behavioral Outcomes in Feelings, Awareness, Values, and Action

As a result of this session, you should be able to:

Describe how you feel about man's effect on this soil environment.
Describe how you feel about man's effect on the soil environment where you live.
Describe what you can do to improve the use of the soil:
in your backyard:
in your community:

Equipment Needed: (for a class of 30 people)

6 La Motte soil pH kits
30 micromonolith cards
6 tape measures
30 sets of lab sheets
3 sticks (50" or 100" long)
labels to differentiate soil horizons
100 jelly cups and lids
3 soil thermometers
2 #10 cans of water
30 hand lenses
3 baby food jars, ½-full of water
3 staplers
1 box staples
2 shovels
3 yardsticks

A LESSON PLAN FOR MEASURING SOME WATER QUALITY CRITERIA

Set the stage for this investigation by reviewing quickly what will take place in the allotted time. For example: In the next 4 hours we will investigate evidences of aquatic life in this stream, infer stream temperature, O_2 and pH from that life, and then check out our inferences through experimentation. We'll determine the streamflow of the stream and discuss ecological, social, and political concerns of using such water. You might want to read the behavioral objectives which appear at end of this lesson plan and refer back to them as an evaluation of the session.

I. DETERMINING WATERSHED BOUNDARIES

Distribute maps of the area, 1 for every person.

TASK A: (15 minutes) Work in small groups.

Find _____ Creek on the map. Find your location.
Where does the water in this stream come from? Trace upstream to its source.
Draw lines around the boundaries of our watershed. We're in the _____ Creek watershed.

II. OBSERVING THE STREAM ENVIRONMENT

Assign Task B, for recording observations of the stream environment. Walk to stream. Distribute Task B cards.

TASK B: (10–15 minutes) Work by yourself or in small groups.

As you approach the stream, observe and record your observations about the stream environment: (Can be done visually and verbally.)

plants _____

animals _____

air _____

rocks _____

water _____

Questions and discussion:

1. What did you notice about the stream environment?
2. What plants were growing on the gravel bar?
3. Why aren't large trees growing on the gravel bar?
4. What did you notice about the rocks?
5. Where did you see the bigger rocks? the smaller?

III. OBSERVING AQUATIC ANIMALS

Questions and discussion:

1. What did you notice about the water in the stream?
2. What do animals need to live in water?
3. Where would you expect to find animals in the water?
4. What guidelines need to be developed by our group as we collect animals from the stream? Discuss what to do with animals kept for observation, what to do with rocks that are overturned, what to do with animals when the session is over.

Distribute Task C cards.

TASK C: (30–40 minutes) Work by yourself or in groups.

Using collecting equipment (screens, jelly cups, etc.) collect as many types of aquatic animals as possible. Put them in the white containers for observation by the group. (Keep the pan in a cool place.)
Contact the instructor when you're finished, to receive the next task.

Note to instructor: Go from group to group to see how they're doing.

IV. IDENTIFYING AND RECORDING AQUATIC ANIMALS

Distribute Task D cards.

TASK D: (20–30 minutes) Work by yourself or in groups.

Using the "Golden Nature Guide Pond Life" books or similar field manuals and attached picture keys, generally identify the specimens you found.

List or sketch the animals you found below.

Description of where found	*Type (name or sketch)*	*No.*

Return animals to water as soon as finished.

Questions and discussion:

1. What animals did you find?
   Compile a group list, (preferably on a chart). Each person should record the group list on his own work sheet, (Task D).
2. Where did you find most of the specimens?
3. What similarities are there among the specimens?
4. What differences did you find?
5. What classification system could we use to classify the aquatic animals we found?
6. What other life would you expect to find in this stream?
7. Would we be likely to find the same specimens in a different aquatic environment? Why or why not?

V. PREDICTING WATER CHARACTERISTICS FROM AQUATIC ANIMALS FOUND

What were the things we said animals needed in order to live in the water?
(Review earlier discussion.)
Assign the following task:

Distribute Task E cards.

TASK E: (15–20 minutes) Work by yourself.

Based on the aquatic animals you found, and the charts below in the Analyzing Data section, predict the following characteristics of this stream:

I predict:

the water temperature will be _____ because _____

the air temperature will be _____ because _____

the pH number will be _____ because _____

the dissolved O_2 count will be _____ because _____

Keep these predictions for your own reference.

ANALYZING DATA

pH RANGES THAT SUPPORT AQUATIC LIFE

	MOST ACID					NEUTRAL						MOST ALKALINE	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Bacteria	1.0												13.0	
Plants (algae, rooted, etc.)						6.5						12.0		
Carp, suckers, catfish, some insects						6.0			9.0					
Bass, crappie						6.5		8.5						
Snails, clams, mussels							7.0		9.0					
Largest variety of animals (trout, mayfly, stonefly, caddisfly)						6.5	7.5							

Task E:—Continued

DISSOLVED OXYGEN REQUIREMENTS FOR NATIVE FISH AND OTHER AQUATIC LIFE

	D.O. in parts per million
Cold-Water Organisms including (salmon and trout)(below 68°)	
Spawning	7 ppm and above
Growth and well-being	6 ppm and above
Warm-Water Organisms (including game fish such as bass, crappie)(above 68°)	
Growth and well-being	5 ppm and above

TEMPERATURE RANGES (APPROXIMATE) REQUIRED FOR GROWTH OF CERTAIN ORGANISMS

Temperature		*Examples of life*
Greater than 68°. (warm water)		Much plant life, many fish diseases. Most bass, crappie, bluegill, carp, catfish, caddisfly.
Less than 68° (cold water)	Upper range (55–68°)	Some plant life, some fish diseases. Salmon, trout, Stonefly, mayfly, caddisfly, water beetles, striders
	Lower range (Less than 55°)	Trout, caddisfly, stonefly, mayfly

Questions and discussion:

1. As a group, discuss the range of predictions.
2. What criteria did you use to arrive at your predictions?
3. How can we test out our predictions?

VI. MEASURING AND RECORDING WATER CHARACTERISTICS TO TEST OUT PREDICTIONS

Directions to group:

We can test out the predictions we just made, using these kits (Hach O_2 pH Testing Kit or equivalent) Open up kit. Mention that instructions are inside lid.

There are lots of jobs to be done in testing (clipping, squirting, swirling, dipping, counting, reading, etc.) so make sure everyone in the group has a job to do.

Work in groups of 5–6 people each. Each group take a kit. Send groups to different parts of the stream.

Note to instructor: It is not necessary to demonstrate the use of the kit. Let the students do it. Task F could be taped somewhere on the water test kit.

Distribute Task F cards.

TASK F: (20–30 minutes) Work in groups of 4–6 people.

MAKE SURE EVERYONE IN THE GROUP GETS INVOLVED IN THE TESTING.

Using the water test kit, determine the water temperature, air temperature, dissolved oxygen count, and pH of the stream.

Record the data below: Also record predictions from Task E to compare.

Location of water sample (edge or middle of stream)	*Time taken*	*Temperature*				*pH*		*Usable oxygen (ppm)*	
		Water		*Air*					
		My prediction	*Actual test*	*My prediction*	*Actual test*	*My prediction*	*Actual test*	*My prediction*	*Actual test*

Questions and discussion:

Have each group report the results of their tests to the entire group. Compare results.

1. What might account for any differences in results from each group?
2. How did the test results compare to the predictions?
3. Is it necessary to have sophisticated equipment to determine temperature, oxygen, pH, etc.? Inferences could be made from the animals found in the stream.
4. What can we say about the quality of the water in this stream?
5. What else would we need to know to decide whether or not to drink this water?
6. Under what conditions might we expect to get different test results than we did today?

VII. MEASURING STREAMFLOW (Use if investigation is being made along a stream.)

Distribute Task G cards.

Questions and discussion:

1. What measurements do we need to know in order to determine the amount of water in this stream? Discuss how to make different measurements. See Task G.
2. Predict how many people could live off the water in this stream._____

TASK G: (45 minutes)

DETERMINATION OF STREAMFLOW

Instructions for collecting and recording streamflow measurements.

a. Measure and mark a 100-foot distance along a straight section of your stream. If you can't find a 100′ section, use 25′ or 50′. Throw a stick (2 or 3 inches long) in the water above the upstream marker. Record the number of seconds it takes to float downstream between the markers. Record below. Now divide the 100-foot distance by the total seconds it took the stick to float between the stakes.

100 ft. (distance)	÷	_____ (total seconds to float 100 ft.)	=	_____ (number of feet stick floated each second)	ft. per second

b. Find the average width of your section of the stream. Measure the width of the stream at 3 places within the 100 foot area. Divide the total by 3 to get the average width of the stream.

First measurement _____ feet.
Second measurement _____ feet.
Third measurement _____ feet.
Total _____ feet ÷ 3 = _____ ft. (average width)

c. Find the average depth of your section of the stream. Measure the depth of the stream in at least 3 places across the stream in a straight line. Divide the total by 3 to get the average depth of the stream.

First measurement _____ feet.
Second measurement _____ feet.
Third measurement _____ feet.
Total _____ feet ÷ 3 = _____ ft. (average depth)

d. Find the cubic feet of water per second. Multiply the average width, average depth, and the number of feet the stick floated each second.

_____ ft. (Average width)	×	_____ ft. (Average depth)	×	_____ (Number of feet per second)	=	_____ (Cubic feet of water flowing per second)

Note: A cubic foot of water is the water in a container 1 foot wide, 1 foot high and 1 foot long, and contains 7.48 gallons.

In order to find out how many people could live from the water in this stream, complete the following calculations.

_____ (Stream flow in Cu. ft. per sec.)	×	7.48 (Gallons in 1 cu. ft. of water)	=	_____ (Gallons of water per second)
_____ (Gallons per second)	×	60 (Seconds in minute)	=	_____ (Gallons of water per minute)

_____ (Gallons of water per min.)	×	1440 (No. minutes in a day)	=	_____ (Total gallons water per day)	÷	*200 Gals. (Amount of water one person uses per day)	=	_____ (Total No. people who could live from water in this stream)

* The average person uses about 200 gallons of water a day for home use. This does not reflect each persons share of water used for industrial, public services, and commercial.

Questions and discussion:

1. How many people in a community could live off the water in this stream?
2. What would happen to this environment if we piped all the water out of the stream at this point to a community?
3. If we were going to use this water, how much water should be left to flow down stream? Why?
4. Does this stream always have this amount of water in it? Why?
5. What are some problems you encountered during this task?

VIII. COMMUNICATING FEELINGS, AWARENESS, AND VALUES ABOUT WATER

Questions and discussion:

Distribute Task H cards.

How important is this stream to us?

TASK H: (10–15 minutes) Work by yourself.

1. Describe in writing how you feel about man's effect on the aquatic environment at this site:

2. Describe at least one action you can take in your everyday life to help improve the way water is managed:

   (a) in your home:_____

   (b) in your community:_____

   (c) in your consumer habits:_____

3. Describe the benefits of each action in #2.

Summary Questions

1. What did you find out about water from our investigations today?
2. Why is water important to the ecosystem?
3. How can we summarize our discussions and investigations?
4. What methods and processes did we use in our investigations today?

Distribute Task I cards.

TASK I:

Describe in writing how you feel about our session today.

Behavioral Outcomes in Knowledge

As a result of this session, you should be able to:

Identify the boundaries of the_____Creek watershed on the map provided.
Predict the pH, temperature, and dissolved oxygen count of the stream, using the list of aquatic animals found and the water interpretation charts provided.
Demonstrate the ability to test out the above predictions using the water testing kit.
Measure the cubic feet of water per second flowing in the stream, and determine what size community of people could live off the water in the stream.
Describe three ways this stream is important to the surrounding environment.

Behavioral Outcomes in Feelings, Awareness, Values, and Action

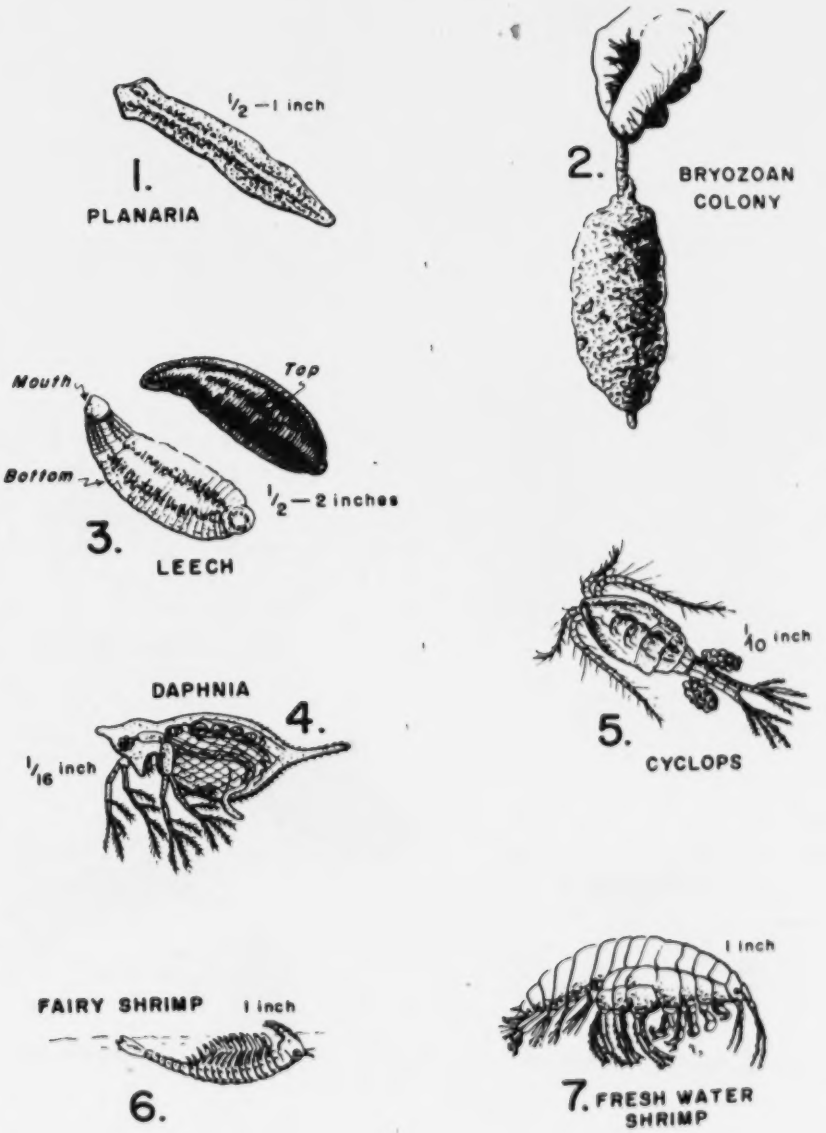
As a result of this session, you should be able to:

Describe in writing how you feel about man's effect on the aquatic environment at this site.
Describe at least one action you can take in your everyday life to help improve the way water is managed:
(a) in your home
(b) in your community
(c) in your consumer habits
Describe the benefits of each of the above actions.

Equipment Needed: (for a class of 30 people)

4 water testing kits (Hach Co. or equivalent)
4 thermometers
4 white dishpans
30 sets of lab sheets
30 jelly cups
30 hand lenses
15 Pond Life books (Golden Nature Guides)
30 maps of the area
4 50′ or 100′ tapes
4 screens (optional)
magic markers
chart paper

SUB-SURFACE
FRESH WATER ORGANISMS



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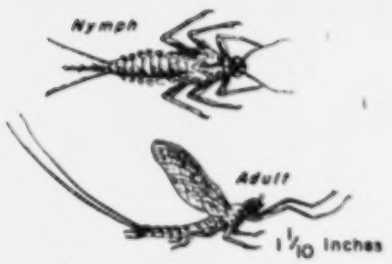
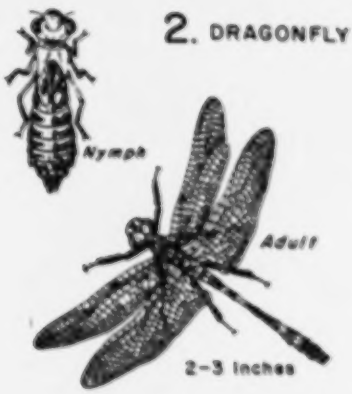
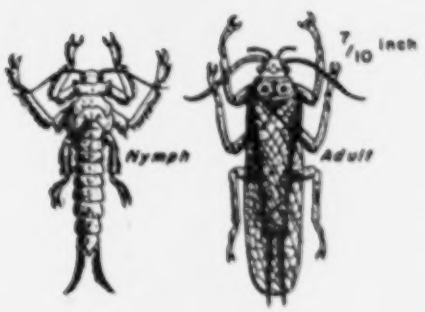
AQUATIC INSECTS



1. MAYFLY



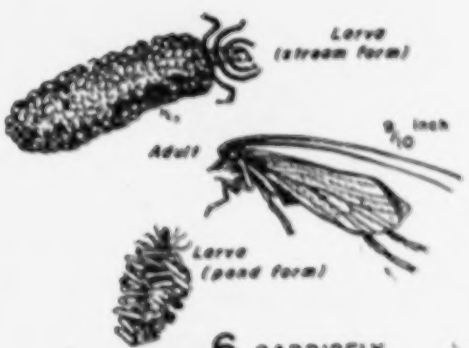
2. DRAGONFLY



3. STONEFLY

4. WATER BOATMAN

5. WATER STRIDER



6. CADDISFLY

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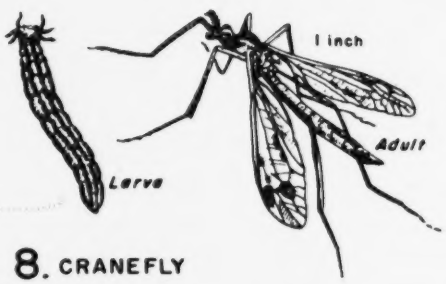
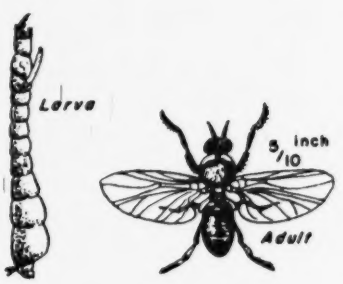
AQUATIC INSECTS

7. WHIRLIGIG BEETLE



8. CRANEFLY

9. MOSQUITO



10. BLACK FLY

11. MIDGE

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A LESSON PLAN FOR INVESTIGATING ENVIRONMENTAL HABITATS

Set the stage for this investigation by reviewing quickly what will take place in the allotted time. For example: In the next 4 hours we will investigate several environmental habitats, infer how animals fit into food chains and energy cycle and how they are important to the environment, record changes in habitats, and discuss what we can do as citizens to improve the biological interactions in our environment. You might want to read the behavioral objectives which appear at the end of this lesson plan and refer back to them as an evaluation of session.

I. OBSERVING AND MEASURING ANIMAL SIGHTINGS AND EVIDENCES

Questions and discussion (10 minutes):

1. What animals would we expect to find living in this area (vertebrate, invertebrate)?
2. What are the needs of these animals?
3. What are some names of the place where animals live?
4. Where would you look for animals around here?
5. Describe and pass out TASK A and B cards.

TASK A: (30 minutes) Work in small groups.

1. Explore as many places (environments or habitats) as you can from (point out boundaries) _____ to _____, and record animals that you see or any evidence of animals. As you inventory the animals or their evidences, figure out some way of recording *amounts* of evidences and animals seen.
2. Look for and list evidence (signs) of animals (partly consumed foods, excrement, homes, bird nests, feather, etc.)
3. Observe and list different habitats for wildlife in area. (Grass, cultivated field, hedges, swamp, etc.)
4. Observe and list animal foods in area:

TASK B: (30 minutes) Work in small groups.

Select three different habitats and compare the numbers of animal organisms and the characteristics in each.

Habitat I	Habitat II	Habitat III
Characteristics of habitat I	Characteristics of habitat II	Characteristics of habitat III

Questions and discussion:

1. What animals did you find in each habitat?
2. Which habitat had the most animals? Why?
3. What were the characteristics of each habitat?
4. What could account for the differences and similarities of the habitats?
5. What factors made one habitat more desirable than another?
6. Pass out Task C cards.

TASK C: (15 minutes)

Build a food pyramid showing the comparative amounts of animal and animal evidences seen.

Questions and discussion (15 minutes):

1. What did you find?
2. How many habitats did you investigate?
3. Which animals around here have the largest habitat? The smallest?
4. What was the largest group of animals found?
5. What do you think their main function in the environment might be?

Discuss terminology and definitions of herbivores, carnivores, omnivores, decomposers.

Pass out TASK D cards.

TASK D: (10 minutes)

List the animals you have seen or their evidences in the appropriate places in this diagram. Use arrows to show direction of relationships, i.e.: energy flows from the sun to living things; plants support herbivores. What other words and ways can you think of to illustrate a similar cycle? Some people call this the energy cycle.

Light

Plants _____

Nutrients

Herbivores (plant eaters)

_____

Decomposers (bacteria-fungus)		Carnivores (meat eaters)
_____	Death	_____
_____		_____
_____		_____
_____		_____
_____		

What would happen if one group were eliminated?
If_____group was eliminated, I think the following would happen:

Questions and discussion (5 minutes):

1. What is the function of each part of the energy cycle?
2. What would happen if the decomposers were removed from this ecosystem?
3. How does the energy cycle relate to a food chain?
4. What is a food chain? (Or, who eats whom?)

Pass out Task E cards.

TASK E: (10 minutes)

Construct a 5-stage food chain using specific animals seen so far.

II. OBSERVING AND RECORDING CHANGES IN ANIMAL HABITATS

Questions and discussion (10 minutes):

1. How did your food chain relate to the energy cycle in Task D?
2. What is difference between food chain and food web?
3. Look at your food chain and see if you can construct a web out of it.
4. What evidences of influences can you name that have affected this environment?

Pass out Task F cards.

TASK F: (20 minutes)

Describe in writing, 3 influences you have discovered that have changed the habitats in this area including the cause and effect relationships that occurred.
Consider:

a. Evidence of change and the influence or factor causing it.
b. What area probably looked like before change occurred and animals that lived then.
c. What area looks like now and animals that live here now.
d. How the change affected the habitat and animal species that did and do live there.

Questions and discussion (10 minutes):

1. Have individuals read their descriptions, and compare different descriptions.
2. What evidences did you find that show man's influence in this area?

III. COMMUNICATING FEELINGS, AWARENESS, AND VALUES ABOUT THE ENVIRONMENT

TASK G: (10 minutes)

Describe how you *feel* about man's effect on one animal habitat you observed.

Questions and discussion:

1. Discuss results of Task G with group.
2. What are some things that man has done to effect the efficiency of the energy cycle? Here? Elsewhere?

TASK H: (15 minutes)

Describe in writing, 3 things you can do in your everyday life to make the energy cycle more efficient and cause the least amount of harm to the ecosystem.

Select the one you think would be your best contribution. Describe the benefits of this action.

a. Where you live.
b. In your consumer habits.

Discuss Results of Task H.

Summary Questions:

1. What did we find out about animals in our field study session today?
2. Why are animals important in the ecosystem?
3. How can we summarize our investigations today?
4. What processes and methods did we use to find these things out?
5. Which of the behavioral outcomes did we accomplish in this session? (Read and discuss.)

TASK I:

Describe in writing how you feel about our session today.

Behavioral Outcomes in Knowledge

As a result of this session you should be able to:

Identify and describe six different animal habitats.

Construct a diagram of an energy cycle, using the evidences and sightings of animal life observed at the site.

Describe at least four cause and effect relationships in the role of the decomposers in the energy cycle.

Behavioral Outcomes in Feelings, Awareness, Values, and Action

As a result of this session you should be able to:

Describe how you feel about man's effect on one animal habitat observed at the site.

Describe three things you can do in your everyday life to make the energy cycle more efficient, and cause the least amount of harm to the ecosystem where you live and to your consumer habitats.

A LESSON PLAN FOR INTERPRETING THE LANDSCAPE IN A FOREST ENVIRONMENT

Set the stage for this investigation by reviewing quickly what will take place in the allotted time. For example: "In the next 4 hours we are going to make some inferences about why we think things are the way they are in this setting based on observations, test out those inferences by experimentation, collect and interpret past events in this experiment, and explore ways we can improve the efficiency of energy cycles." You might want to read the behavioral objectives which appear at the end of this lesson plan and refer back to them as evaluation of the session.

The following activities will help you look for observable changes, relationships, patterns and trends, in order to interpret past events, understand present relationships, and indicate future trends in the forest environment.

1. OBSERVING AND INFERRING WITH CROSS SECTIONS An example of using observable evidences to infer past events in a forest.

Distribute cross sections and Task A cards. Cross sections of trees can be 4–6″ in diameter or larger, and should show a variety of growth patterns and influences (fire, insects, etc.).

TASK A: (on cards) (5–10 minutes) Work with 1 or 2 other people.

Write down some things you notice about the cross sections.

Questions and discussion:

1. What are some things you noticed about the cross sections?
   Accept all comments from group. List on board or chart.
2. Focus on 2 or 3 items for discussion:
   Why did you say . . . (your cross section had evidence of fire)?
   What could account for . . . (the rings being irregular)?
   What are some things that could account for . . .?

Distribute Task B cards.

TASK B: (on cards) (10 minutes) Work with 1 or 2 other people.

Select 3 observations about the cross sections from the group list.
List possible reasons for these observations.
List ways you could set up an investigation to find out more about your observations and inferences.

TASK B—Continued

Observation (what you noticed)	*Inferences (possible reasons for this)*	*Investigations (how we could find out)*
1.		
2.		
3.		

Questions and discussion:

1. Ask for reports on the above chart from several groups (as time allows).
2. Which of these investigations could be carried out in the study area?
3. Keep the lists of observations and inferences for reference at the end of this session.
4. What could tree rings from this forest tell us about past and present events in this environment?

II. COLLECTING AND INTERPRETING DATA ABOUT TREE GROWTH RATE AND COMPETITION

Task C (with tree cores) requires preparation by the instructor before the session.

A tree stand should be selected for study and 4–5 trees tagged. Trees should be selected that show effects of environmental conditions—injury, overcrowding, lack of sunlight, etc. The tagged trees should be bored with an increment borer ahead of time. Resulting cores should be numbered to correspond with number on the tree. Put tree cores in see-through plastic straws and tape to a cardboard, in liquid resin, plastic wrap or other transparent material to facilitate handling. If study area is to be used repeatedly, save cores to eliminate necessity for reboring trees.

Note: If trees showing effect of various environmental conditions are difficult to find, stumps of trees that grew under a variety of competitive influences can also be used for study instead of tree cores.

Distribute Task C cards.

TASK C: (Part 1) (15–20 minutes) Work in groups of 4–5 people.

1. Observe the tree core your group has been given and record the following information: (See drawing of tree core to help interpret the tree core.)

Tree No.	*No. dark rings from center to bark (approx. age)*	*No. dark rings in last inch*	*Remarks about the pattern of the rings*

2. When your group has the above information, one person from the group should record this information on the blackboard or chart. Chart to be like TASK C, part 2.

TASK C: (Part 1)—Continued

DRAWING OF TYPICAL TREE CORE

(Part 2) (10–15 minutes) Work in small groups.

Record the following information about tree cores from the master chart. (Instructor will provide the diameter information.)

Tree No.	*No. dark rings from center to bark (approx. age)*	*Diameter of tree trunk (cir. ÷ 3)*	*No. dark rings in last inch*	*Remarks about the ring pattern*
1				
2				
3				
4				
5				
6				

Questions and discussion:

1. What similarities do you notice in the data about the trees?
2. What differences do you notice in the data about the trees?

TASK C: (Part 3) (20–30 minutes) Work in small groups.

Set up an investigation to find out reasons for some of the differences in the data.

1. Select 2–3 trees from the list that show differences in growth rates.
2. Which trees did you select? (Indicate by number.)_____
3. Why did you select these trees?_____
_____

TASK C: (Part 3)—Continued

Go with your group to the site of the trees you selected for investigation and do Part 4.

Part 4 (30–40 minutes) Work in small groups.

Collecting and Recording Data. Record your observations:

Interpreting Data. Record possible interpretations of the above data:

Summarizing your Investigation. Write your group's summary below, including:

what you were trying to find out
what data you collected about it
what interpretations you made
what other data would you collect about your investigation?

Questions and discussion:

1. Ask for 2-3 minute summaries from several groups.
2. What problems did you encounter in this task?
3. What other data could you collect about your investigation?
4. What does the information tell us about the past events of this environment?
5. How would you summarize the major factors affecting the growth of this forest?

III. INTERPRETING PAST EVENTS

Distribute Task D cards.

TASK D: (30–40 minutes)

Look for evidence of change, natural and man-made, in the environment. Record and fill out other columns.

Evidence of changes in the environment	*What might have caused them?*	*Effect on the environment*

Describe the way the area around you probably looked 25 years ago.

Describe how you think the area around you might look 25 years from now.

Questions and discussion:

1. What evidence of change did you find?
2. What might have caused this?
3. What was the effect of _____ (this change) on the environment? Allow time for interchange of ideas between group members. The same changes may have been noticed, and there may be many interpretations of their causes and their effects.
4. What do you think this area looked like 25 years ago?
5. How do you think this area will look 25 years from now?

TASK E: (10 minutes)

Describe in writing how you feel about the changes in this environment.

IV. INFERRING CHANGES IN A ROTTEN LOG OR STUMP

Find a rotten stump or log.

Questions and discussion:

1. What things about this stump give us clues about the past events that have taken place?
2. What factors caused these things to happen?

Distribute Task F cards.

TASK F: (15–20 minutes) Work in groups or by yourself.

NOTE: DO NOT TEAR THE STUMP APART! Discuss why.

What things are changing the rotten stump now? Record below:

Living things	*Effect on stump*

TASK F—Continued

Non-living things	*Effect on stump*

Questions and discussion:

1. What cycles are taking place in the rotten log or stump?
2. Construct a diagram of one of the cycles taking place in the rotten log or stump:

Distribute Task G cards.

TASK G: (15 minutes) Work in groups.

Construct a diagram of one of the cycles taking place in the rotten log or stump.

V. TRANSFERRING THE PROCESS TO OTHER ENVIRONMENTS

Questions and discussion:

1. What are some other things that could help us make further interpretations about this environment? List on board.
2. Using one of the items listed in 1 above or any other you can think of, do TASK H. Distribute task cards.

TASK H: (30 minutes)

Describe in writing an alternative activity you could have done to establish a time sequence for the past events in this environment.

Describe in writing an activity you could do in a *city environment* to establish a time sequence for the past events in the environment.

Activity	*What it would tell you about the past events in the area*

Describe an activity you could do in the area around your school to establish a time sequence for the past events in the area.

Activity	*What it would tell you about the past events in the area*

VI. COMMUNICATING FEELINGS OF AWARENESS THROUGH SKETCHING

Distribute sketching paper, and pieces of charcoal from a campfire or fireplace.

TASK I: Give these directions verbally. No task card is required.

Construct a sketch using the charcoal. Other sketching materials will be given to you as you work.

Subject of sketch depends on the setting. It can be anything that is significant about the area: rotten log, stump, or snag; an old homestead, fence, or barn; a city building, transmission tower, or freeway.

While people are sketching, go around and give them: rotten wood—brown, dandelion leaves—green, dandelion flowers—yellow, other natural materials, in season. If you're not in the woods, IMPROVISE!

VII. COMMUNICATING FEELINGS OF AWARENESS AND VALUES THROUGH WRITING

Begin this part when about half the people finish their sketch.

TASK J: Give these directions verbally. No task card is required.

Use your pencil or pen.
Find a place on your sketch (across the bottom, or down the side) to write some things.
Write 2 descriptive words about the stump (words that tell what it looks like).
Write 3 action words about the stump (words that describe processes or changes taking place, or things happening to it).
Write a short phrase (4–5 words) that tells how the stump affects the rest of the environment (a phrase to describe its value or usefulness, or a phrase describing *any* thought you have about the stump).
Write 1 word that sums up everything about the stump (a word that suggests a comparison, an analogy, or synonym).
Optional: Now, if you wish, go back and give a title to what you have written.
Congratulations. You have just written a poem in the form called cinquain.

Pace the preceding directions to the needs of the group. People shouldn't feel pressured while writing this—be casual. It's good to mention that they may not wish to write something for every direction that is given.

Review the directions now and then for people still thinking.

Have people read their poem if they wish.

Question to think about:

In what ways does this description show your feelings and awareness of the environment?

Summary Questions

1. What did we find out about the environment in our session today? (List on chart, if time.)
2. Why are these things important to the way we manage the environment?
3. How can we summarize our discussion (or investigation)? (What are some big ideas that would sum up what we've just said?)
4. What methods and processes did we use in our investigations?

Distribute Task K cards.

TASK K:

5. Describe in writing how you feel about our session today.

Behavioral Outcomes in Knowledge

As a result of these activities, you should be able to:

List at least three observations about the cross sections provided, and infer possible reasons for each observation.

Describe ways to set up an investigation to find out more about the above observations and inferences.

Set up an investigation (collect and record data) to find out reasons for growth rate differences in a given stand of trees.

Describe activities appropriate to other environments for interpreting the landscape.

Identify and list at least three evidences of change in the environment, and infer the cause-and-effect relationships of those changes.

Construct a diagram of a natural cycle occurring in a rotten stump.

Behavioral Outcomes in Feelings, Awareness, Values, and Action

As a result of these activities, you should be able to:

Describe how you feel about one change in this environment.

Communicate feelings of awareness by constructing a sketch of a given object in the environment, using natural materials.

Communicate feelings, awareness, and values by describing in writing the effect of a given object on the environment.

Equipment Needed

30 cross sections of trees
6 increment cores (preferably in plastic) from numbered trees
30 hand lenses (optional)
30 pieces sketching paper
lab sheets
task cards
natural materials for sketching
measuring tapes—cloth ones are satisfactory

A LESSON PLAN FOR A LAND USE SIMULATION GAME

Set the stage for this investigation by reviewing quickly what will take place in the allotted time. For example: "During this investigation we are going to participate in a simulation game concerning land use in a hypothetical community, analyze what we have done, and present some ideas which will enable you to develop your own simulation game based on local environmental issues or concerns." The techniques used in simulation games combine elements of simulations, games, and role-playing. Students assume the roles of decision-makers in a simulated environment and compete for certain objectives according to specified procedures and rules. (Note to teacher: Use as much of the information about simulation games included below as needed. This will depend on how familiar participants are with this type of activity.)

Some Information About Simulation Games (Use as needed to set stage.)

Simulations are operating models of real life situations. They may be about physical or social situations.

Most simulations for classroom use involve *role-playing*—the roles being acted out to correspond to the functioning of some real process or system.

Most simulations for classroom use involve *gaming*. A game is defined as something enjoyable—however serious it might be—involving competition for specified objectives and observing rules.

Some simulation games are based on environmental issues. What are some benefits of using simulation games as an instructional technique for investigating environmental problems?

They're fun.

They get people involved.

They are a logistically easy way of helping to prepare people for becoming involved with solving environmental problems.

People analyze cause-and-effect relationships of environmental issues.

People are put in role-playing situations where they have to suggest alternative solutions to environmental concerns.

People are forced to evaluate the consequence of decisions in discussion or on paper before these decisions are carried out in reality.

People interact with each other in the *decision-making* process.

So . . . simulation games not only:

develop understandings about problems in the environment and

develop awareness and concern about those problems,

But they help people develop skills they need for citizen action and involvement in environmental management.

I. INFERRING, RECORDING AND CLASSIFYING POSSIBLE USES OF LAND

Discussion:

A. Distribute TASK A, Centerplace City Land Use Problem.

B. The problem to be decided is what are some possible uses for the one-square mile (640 acres) of county farmland, four miles northeast of the city. It is now available for the city's use.

TASK A: (10 minutes) Work by yourself.

Read the background information for Centerplace City, and then list some possible uses of the vacant farmland.

"One square mile of unused county farmland, four miles northeast of the city is now available for the city's use."

Background Information Sheet: Centerplace City

The population is 250,000 and rapidly increasing.

The city's boundaries are being extended, but the suburban fringe is expanding even more rapidly.

The rapid population growth is accompanied by demands for more housing, more jobs, additional city services, and recreational areas.

The power for industrial uses, adequate public transportation, and a skilled labor force are available.

The city is located near forests, which are to the north.

The land to the east is devoted mainly to farming.

The Pipe River is unpolluted and is the source of irrigation water as well as the municipal water supply.

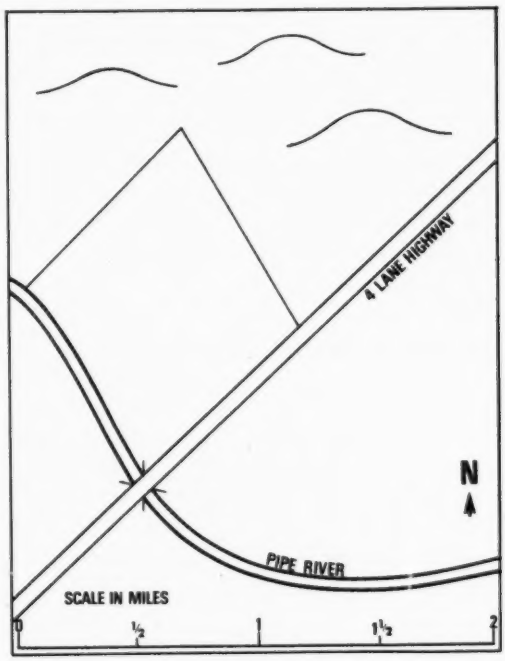
The river is too small for freight transportation, but logs could be floated on it.

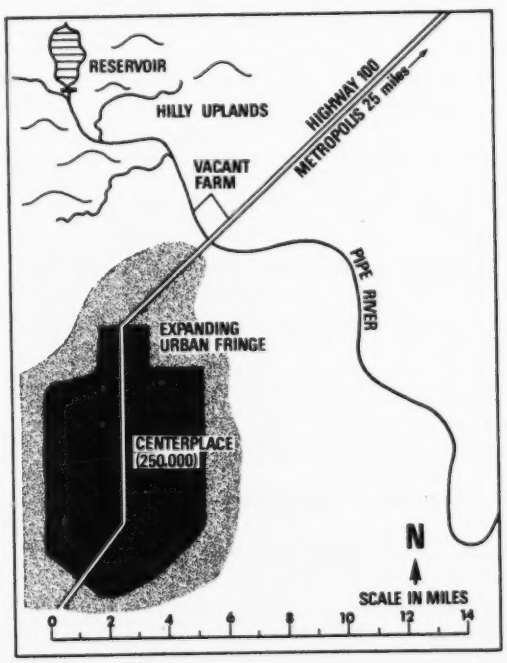
The gravel bed of the river is appropriate raw material for concrete manufacture.

The present sewage treatment plant and garbage disposal area are at maximum capacity. The citizens of Centerplace are concerned about the maintenance of a scenic regional environment.

The County Board of Control is the authority for land zoning, and many citizens' groups are developing to influence zoning decisions.

List possible uses of the land below:





Questions and discussion:

Note: When most people have started to write down uses on Task A, go ahead with question #1.

1. What are some possible uses for the undeveloped land? As people respond, write all comments on board, just as they say them. Don't paraphrase for them unless they are too wordy, in which case, ask: "How shall I write that on the chart?" If they give major categories right away, like Recreation, or Industry, say, "Can you give me an example of that?" Number the items as you go along—to simplify identification later. When you get 15 or 20 items, STOP.
2. "Which of these uses are similar?" Designate similar uses by letters—A, for all of one type; B, the next, etc. When most are designated with a letter, or the group seems to run out of thoughts, STOP. It's okay to change the groupings if the students change their minds along the way in #2 above.
3. What label could we give to all the items in A? "What label could we give to Group B?", etc., e.g. Recreation, Industrial, Utilities, Housing, Commercial. It's okay if they suggest more than one label for a Group; write them both down.

II. DEVELOPING AND GIVING PRESENTATIONS

1. Divide the class or group into the number of categories decided on in #3. There shouldn't be more than 6–10 in each group. Assign each group to one of the use categories.
2. Each group is to represent the special user group assigned.
3. Pass out TASK B and inform the students they have 10 minutes to list and analyze possible uses for the vacant land in the assigned category. They may consider those listed on the board in their category plus any other possible uses they can think of for the category.

TASK B: (10 minutes) Group #_____ Assigned Category of Land Use_____

Your task is to analyze and list possible consequences of different land uses within your assigned land use category.

Use	*Advantages to land/people*	*Disadvantages to land/people*

(At end of 10 minutes go on.)

Discussion:

Tell group: Now go on to TASK C. You have 20 minutes to plan a strategy and develop a 3-minute presentation to be made to the County Board of Commissioners.

a. This presentation will be a proposal for developing the undeveloped farmland.
b. You must have a visual display such as a land use map drawing as a part of your presentation.
c. More than one person in your group must help in making the presentation.

Distribute Task C cards.

TASK C: (20 minutes)

Develop a strategy and method to present your plan of development to the County Board of Commissioners or appropriate local authorities.

Note: If possible, have a staff person assigned to each group to make written observations about how the group was able to work together to solve the problem.

1. Ten minutes into Task C, have each group select one of its members to meet together as the County Board of Commissioners. Take the Board into another room, and tell them they will be responsible for hearing the presentations and deciding upon the best one. Their job in the next 10 minutes is to:
   a. Develop the criteria they will use in evaluating the proposals.
   b. Develop some kind of matrix they can each use while the presentations are being given to record their evaluations.
   c. Elect a chairman to preside during group presentations.

CRITERIA

Presentation			

2. Twelve minutes after groups start planning TASK C, remind them they have 8 minutes left to have their verbal and visual presentation ready. Let groups have 5 more minutes to finish if needed.

3. Have Board of County Commissioners enter room and sit up front. Appoint a timekeeper to cut all presentations off at 3 minutes (give 2-minute warning). Announce: "Because of time, there will be no rebuttals or discussion." The Board may want to ask questions or have rebuttal time after all presentations. However, allow only 5–10 minutes for this part so it won't get out of hand.

4. After 3 is finished, the Board retires for 5–10 minutes to select the best proposal.

5. While Board is meeting, each small group is to develop a list of criteria they think should be used in choosing between the plans submitted.

6. County Board of Commissioners announces their *decision* and gives reasons why.

7. County Board of Commissioners reads their criteria aloud.

Questions and discussion:

1. Did new leadership emerge during this session? What factors enabled this to happen? Call on staff observers if used.

2. Did your group work as a team? What did your group do to insure participation by all members of group?

3. What happened in the groups? How did you feel as a person? What about the criteria used? How did each observer see the interaction in the groups?

4. What additional data would you have liked to have had for your groups? List on board, e.g.: topography, vegetation, economy of area, railroad, shopping center, adjacent land, climate, soil survey, historical information, flood plain, wildlife, interest of board of control, money available, educational needs, regulations by State, existing zoning, political climate, population information (age needs, race, jobs). What elements in the community discussion might support each interest?

Note: This is one of the most important parts of the activity because it emphasizes that we need a variety of information and data before we can intelligently make a land management or environmental decision to *best* meet the needs of people and their environment. This question list has all the elements that need to be considered in studying a local environmental issue or concern. It also includes elements of all the curriculum subject areas (social studies, science, language, arts, etc.).

III. ANALYZING CHARACTERISTICS OF SIMULATION

Questions and discussion:

1. One group of people working with simulation games has identified at least three basic characteristics of most simulation games:
   a. There is a problem to be solved.
   b. The factors affecting the decisions are identifiable.
   c. Groups or individuals with different interests who will be affected by the decision can be identified.

2. Let's see if the game we just played has these components.
   a. What was the clearly defined problem in the Land Use Alternatives Simulation?
   b. What factors influenced the decision in the Land Use Alternatives Simulation?
   c. We assigned groups to fit each role in the Land Use Alternatives Simulation, but we all helped develop those roles from the items we listed on the chart. What group or individual roles were identified? How were they identified?

IV. DEVELOPING YOUR OWN SIMULATION GAME (OPTIONAL)

Discussion:

The most exciting simulation games are those people develop themselves, based on local environmental issues in their community, State or region.

Can you think of some current environmental issues in your community around which you could develop a game? Call for responses.

For the next 30 minutes, you will work with one or two other people, developing the format for a simulation game based on a local land use issue described in a news article. (Have copies of current newspaper article available if students want to use them.) Remember that three basic characteristics of a Simulation Game are:

1. There is a problem to be solved;
2. The factors affecting the decision are identifiable; and
3. Groups and individuals with different interests who will be affected by the decision can be identified.

At the end of that time, we would like to hear from several of you about what you have developed.

Pass out TASK D Cards.

TASK D: (30 minutes)

DEVELOPING A SIMULATION GAME

Work with 1 or 2 other people.

Using a newspaper article about a local environmental land use problem, develop the format of a simulation game, considering the following items:

Identify the problem or issue to be decided upon.

TASK D—Continued

Identify the choices available to the decision-makers.

Identify the factors having an influence on the decision.

Identify individual or group roles.

Identify the factors (for or against) assigned to each role.

TASK D:—Continued

Establish conditions for the players (i.e., resources, voting procedures, bargaining money, etc.)

Develop specific goals or objectives for the players.

Include limits or rules for what is permissible behavior (time factor, trading, No. points, money allocations, etc.).

Ask for reports from those who want to share.

Questions and discussion:

1. How can you use the techniques in this session in your job situation? Classroom?
2. How could a game like this develop decision-making skills in environmental management?
3. Have any of you used simulation games? Tell us about your experiences.
4. How can we take this process and use it to involve the public in social and political decision-making action projects in the community?
5. How can we summarize the use of simulation games in studies about the environment?
6. Which of the behavioral outcomes did we accomplish in this discussion? (Read and discuss.)

If the group is interested in further analysis of the elements of simulation use the following:

1. One important characterististics of a simulation is a clearly defined problem, including the choices available to the decision makers.

TASK D—Continued

a. How would you formulate the problem or issue you were asked to decide upon?
b. Did the developer of this simulation simplify the choices?
c. If so, how did he do it?

2. A second major characteristic of educational simulation is the factors having an influence on the decision. Several objectives and subjective factors to be considered in making a decision need to be clearly identified. These factors indicate the data that are relevant to each of the possible choices.
   a. What factors were selected as influences on the decision?
   b. Which of these factors would you classify as objective?
   c. Which of these factors would you classify as subjective?

5. A third characteristic of educational simulations is the use of identifiable group or individual roles to present information about the problem and many of the variables in the situation. Also a role can be planned to incorporate a limited number of factors that influence the choice to be made.
   a. What roles were identified?
   b. What variables did these roles contribute to the decisions?
   c. What additional roles could have been identified?

Distribute Task E cards.

TASK E:

Describe how you feel about our session today.

(Have commercial games such as Dirty Water, Ecology, Coca Cola Game, Pollution, etc., on display if possible.)

Behavioral Outcomes in Knowledge.

As a result of this session you should be able to:

TASK E—Continued

1. Identify and describe three component parts of simulation games.
2. Construct your own simulation game based on a current environmental issue.
3. Name and describe at least 10 important types of data needed before making a land management decision.
4. Identify cause and effect relationships that exist in environmental management.
5. Describe alternative solutions to solving specific problem.

Behavioral Outcomes in Feelings, Awareness, Values, and Action.

As a result of this session you should be able to:
1. Describe how the information in #3 above affects your life, community, and the management of the environment.
2. Outline a plan of action to affect a solution or partial solution through the social and political decision-making process about the environmental issue you used in developing your own simulation.

Equipment needed
blackboard or easel
chalk or magic markers
newsprint or butcher paper (enough for each group to make visual display)
magic markers (4 colors for each group to make visual display)
masking tape
task cards
commercial games on display

The Centerplace City problem has been adapted with permission from the May 1970 Journal of Geography from the article "A Land Use Alternatives Model for Upper Elementary Environmental Education" by Dennis Asmussen and Richard Cole, University of Washington.

References: There are many publications on simulation games. Two that may be of value to you are:
1. Games in Geography, Rex Walford, Longman group limited, London paperback.
2. Simulation Games for the Social Studies Classroom—from The Foreign Policy Association, 345 East 46th St., New York, N.Y. 10017. Library of Congress #68-24538.

A LESSON PLAN FOR COMPARING TWO ENVIRONMENTS

It is exciting and important to make a comparison between two environments. This can provide an opportunity to explore the factors that allow for differences and likenesses in at least two parts of our total environment.

I. SUMMARIZING EACH ENVIRONMENT

After an in-depth study of two different environments, have small groups do TASK A.

Note: An in-depth study of a Forest Environment might include the investigation of Land Use Planning, Measuring Some Water Quality Criteria, Investigating a Forest Environment, and Environmental Habitats. An in-depth study of an Urban Environment might include the investigations of Land Use Planning, Water Quality Criteria, and Urban Investigation.

Distribute Task A cards.

TASK A: (15 minutes) Work in small groups.

Analyze the data collected for each environment and do the following:

1. List four things you found out about _____ environment.

    1.

    2.

    3.

    4.

2. List four things you found out about _____ environment.

    1.

    2.

    3.

    4.

Questions and discussion:

1. List and group items on board.
2. Which things are similar in each environment?
3. Why do you think this is so?
4. Which things are different?
5. Why do you think this is so?

Distribute Task B cards.

TASK B: (15 minutes) Small groups.

List at least four basic functions of each environment.

_____ environment _____ environment

1.

2.

3.

4.

Distribute Task C cards.

TASK C: (15 minutes) Small groups.

List three factors that affect the quality of the two environments.

_____ environment _____ environment

1. 1.

2. 2.

3. 3.

Questions and discussion:

1. Discuss the results of TASK B-C with the group and list on board next to TASK A results.
2. In what way (if any) will the environments have an affect on each other?
3. Based on your own investigations, what are some general factors that apply to both environments?
4. Summarize the unique contribution of each area to society.

Distribute Task D cards.

TASK D: (15 minutes) Small groups.

List at least four of the most obvious problems of the two environments.

_____ environment _____ environment

1.

2.

3.

4.

Distribute Task E cards.

TASK E: (20 minutes)

List at least four guidelines that you would use in planning for future land uses in both environments.

1. _____ environment

2. _____ environment

Distribute Task F cards.

TASK F:

What can we say about environments?

Behavioral Outcomes in Knowledge

After this session you should be able to:

Identify four basic functions about each environment.
Describe three ways in which the environments are interrelated.
Identify three factors common to both environments.
Describe three similarities and differences between each environment.

Behavioral Outcomes in Attitudes, Awareness, Values, and Action

Describe at least two unique contributions that each environment makes to society.
Identify at least three guidelines that you would use in planning for management of the environments.
Describe how you feel about man's use of each environment.
Describe your recommendations for the future management of the area.

A LESSON PLAN FOR INVESTIGATING AN URBAN ENVIRONMENT

Set the stage for this investigation by reviewing quickly what will take place in the allotted time. For example: During this session we want to investigate an urban environment and collect information that will tell us about the livability, functions, needs, and problems of this community. In addition to finding out about this community, you will be developing procedures you can use with your students to investigate your own community.

I. IDENTIFYING COMPONENT PARTS OF AN URBAN ENVIRONMENT

1. Distribute a copy of a map of the urban area you want to investigate to each person. Have it large enough to make notes on when in the field.
2. Working in small groups, list as many things as you can think of that might affect the quality of the environment in this community.

Distribute Task A cards.

TASK A: (20 minutes) Work in groups of 5-6.

List some things that might affect the quality of the environment in this community. (Use map and past knowledge of area.) Group items by categories and label categories.

Questions and discussion:

1. What categories did you come up with? List on board just as groups report (e.g., human factors, land use, transportation, community facilities, etc.). If group listed individual items in the community, you may have to group and label into large categories (housing, commercial, utilities, transportation, land, etc.).
2. What criteria would you use in selecting an area of this community to study?
3. Have each group spend *10-15 minutes* drawing boundary lines around an area they decide to investigate. Use map passed out at first.
4. What could you do in this community to collect first-hand information about each of the categories decided upon?

II. CONSTRUCTING AND DEVELOPING AN INVESTIGATION

Distribute Task B cards.

TASK B: (60 minutes)

Develop a plan of action to investigate the part of the community chosen. Consider such things as: how to divide responsibility for collecting information; what information to collect; will the group stay together or split up; most efficient ways to collect and record information; tools needed to record information.

Note: Information in TASK B should show relationships between items from the inventory, cause and effect relationships, conflicts and complements, information should show specifics or details which help explain or clarify a relationship. Methods may include: questioning, opinion polls from residents, user counts of facilities, traffic counts, maps in greater detail, etc.

Ask each group to report briefly on the procedures they have developed for the planned investigation of the _____ community.

III. COLLECTING, RECORDING, AND REPORTING SURVEY INFORMATION

Distribute Task C cards.

TASK C: (3–4 hours) Field investigation.

Each group spend 3–4 hours to do a visual survey and investigation of that portion of the community decided upon, using the methods of collecting, recording, and interpreting data each group developed.

Distribute Task D cards.

TASK D: (5 minutes, each group) After return from field investigation.

Plan a 5-minute report that describes the methods used and the information collected in TASK C. The report must use the following criteria:

a. Use more than one person as spokesman.
b. Use visual displays.
c. Include a variety of information media and methods of getting it.
d. 5-minute time limit.
e. Consider—what you did, how you did it, what it meant.

Questions and discussion:

1. What are some component parts of the environment that you just investigated? (List on board) e.g., roads, homes, business, river, recreation.
2. In what ways are the component parts interrelated? e.g., transportation to business, buildings to public utilities, transportation to land forms, strip city development to transportation, etc.
3. How does each part of the community investigated relate to the other areas? To the total community?
4. What would happen if one whole segment of the community were eliminated? One category?
5. What examples are there in your area that:
   illustrate the past—
   typify the present—
   indicate the future—
6. What are your recommendations for meeting future needs in this area?
7. If you were the city planning commission, what guidelines would you develop for consideration of future developments in this area?
   a.
   b.
   c.
8. Identify three factors that affect the quality of your area.

IV. IDENTIFYING AND CONSTRUCTING AN INVESTIGATION OF ONE ENVIRONMENTAL PROBLEM

Let's take an example of one interrelationship and investigate one segment of it.

Note: Pick one example such as transportation—traffic congestion and have group list items under the following three columns, one column at a time.

What we want to find out about the interrelationship	*How to collect the information*	*How to record information*
e.g.: How many cars	survey-visual count,	graph
Where they go	questionnaire	description
Where come from	questionnaire	map location

Distribute Task E cards.

TASK E: (30 minutes) Work in original small groups.

Select one interrelationship or problem that you identified and develop an in-depth investigation to find out more about it. Consider: What you need to find out about it, actual samples of how to collect and record information, cause-effect relationship, alternative solutions to the problem, where to collect additional data, what social and political decision-making processes are available.

Note: If this whole lesson is done over an extended period of time, each group should be allowed to carry out its investigation.

Questions and discussion:

1. Have each group make a report covering points in TASK E.
2. Now that we know more about the _____ community, do TASK F. Distribute task cards.

TASK F: (15 minutes) Small groups.

List what you can say about your study area in relation to its: (consider past, present, future)

Functions	*Problems*	*Needs*

Questions:

1. What are the basic functions of your study area? Whole community?
2. What are some of the most obvious problems?
3. What are some of the needs of the study area?
4. Identify three factors that affect the quality of the environment in the area studied.
5. What impact does this survey area have on the management of the community?
6. What additional information would you like to have had before making a decision?

V. COMMUNICATING FEELINGS, AWARENESS, AND VALUES

Distribute Task G cards.

TASK G:

Describe what you would do to solve or improve the problem you identified in TASK E:
as a member of a community action group
as a part of the political decision-making process in your community.

Questions and discussion:

1. Discuss individual comments.
2. What type of community action can we take to identify and motivate people to collect, interpret data, arrive at alternative solutions, and take intelligent action to decide on the best solution consistent with the needs of the environment and society.

Summary questions:

1. What did we find out about the environment in our study?
2. How can we summarize our discussion and investigations?
3. What processes and methods did we use in our investigation today?

Distribute Task H cards.

TASK H:

Describe in writing how you feel about our session today.

MICRO-URBAN INVESTIGATIONS (OPTIONAL)

In addition to major component parts or categories of an urban environment, there are many opportunities for small individual environmental investigations.

Investigations of this nature should be developed in writing along the same procedures as in TASK B, C, or E.

Distribute Task I cards.

TASK I:

Develop in writing an investigation about some part of the man-made environment.

a. Describe procedures for conducting the investigation in action or process terms.
b. State objectives in behavioral outcomes that indicate some minimal expectations in acquiring new knowledge and skills.

Here are some suggested micro-urban environmental investigations:

1. Correlation of observable weather conditions to air pollution index.
2. Correlation of man-made sounds to noise pollution.
3. Effect of signs and billboards on sight pollution.
4. Effect of architecture on aesthetics.
5. Impact of local shopping center on community.
6. Supermarket survey (packaging, buying habits).
7. Interpret the man-made landscape using architectural styles, etc.
8. Observe and record life in a park.
9. Man's effect on watersheds through paving.
10. Under what conditions plant life can live in a blacktop environment.
11. Compare a downtown city block to a residential block.
12. Determine the effect of different types of man-made surfaces on water holding capacity and runoff.
13. Environment of a city tree.
14. Determine what is in a city block.
15. Noise pollution. Determine where noises occur most frequently and which city noises could be reduced to minimize noise pollution.
16. An analysis of traffic past a given point.
17. Inventory and classify historic structures within the central business district of your hometown and determine necessities for their protection.
18. The effect of a four-day work week on the community environment.
19. Does storm runoff from city streets contribute to water pollution?
20. Identifying factors and developing tools to help in recording and interpreting air pollution indexes in the local community.

Behavioral Outcomes in Knowledge

As a result of these activities, you should be able to:

Identify at least three factors that affect the quality of the environment.

Describe a procedure to use in initiating an environmental investigation that can take place in any urban environment.
Identify at least three component parts of an urban environment.
Describe four interrelationships that exist between component parts of the environment.

Behavioral Outcomes in Feelings, Awareness, Values, and Action

As a result of these activities, you should be able to:
Describe what you can do to become involved in community action programs that identify and suggest solutions to local environmental problems.
Describe how you and other people in the community can become involved in affecting the local political decision-making process through environmental urban investigations.
Analyze the cause and effect relationships of factors affecting the quality of the environment. This is prerequisite to any positive change.
Identify forces and change agents that can be used for or against an improved livability of the area.

Equipment needed: enlarged maps of the urban area to be investigated, blackboard or newsprint easel, magic markers or chalk, paper and pencils.

Additional Information

The following work sheets could be used to provide additional information to people investigating an urban environment after they have completed TASKS A, B, and C. The group may identify different component parts of the environment than those listed here.

LAND USE SURVEY WORK SHEET

1. *Inventory and plot on map*

List the major uses of land in the area under study.
Group these uses into appropriate categories.
Label the categories.
Develop a legend for plotting this data on the map.

2. *Additional Information*

DEVISE YOUR OWN METHODS TO COLLECT AND RECORD DATA.

SUBMIT THE METHODS AND THE DATA, IN WRITING, TO YOUR GROUP LEADER AT THE END OF THE SESSION.

How does each land use affect the other land uses of the area?
What problems exist because of certain land uses?
What land use problems in this area are related to regional (e.g., Portland metropolitan area, San Francisco Bay area, Atlanta metropolitan) environmental problems?
What things are being done to the land that are compatible with:
the characteristics of the land?
the needs of the people?
Which land uses are changing?
What proposed projects could affect land use patterns in this area?

Note: The above questions are designed to help you look for significant relationships between things in the environment. Time may not allow you to investigate all of the suggestions. Therefore, you will have to decide which things are most significant in the time allowed. Feel free to add to the list or change it as needed.

Something to think about. For each of the land uses you investigate, ask yourself:

Is it in a good location to serve its purpose?
What does it do to the environment?
What kind of an environment does it have?

3. *Summary questions on land use survey*

See questions and discussions after TASK D.

TRAFFIC AND TRANSPORTATION SURVEY WORK SHEET

1. *Inventory and plot on map*

List the major traffic routes in the area.
Group these routes into appropriate categories.
Label the categories.
Develop a legend for plotting this data on the map.

2. *Additional information*

DEVISE YOUR OWN METHODS TO COLLECT AND RECORD DATA.

SUBMIT THE METHODS AND THE DATA, IN WRITING, TO YOUR GROUP LEADER AT THE END OF THE SESSION.

List the major user groups of each category listed in #1 above.
Which are the most heavily traveled routes?
What problems are associated with traffic and transportation in the area?
What is the effect of these problems on the rest of the study area?
What traffic and transportation problems associated with this area are related to regional (Portland metropolitan area) environmental problems?

What proposed projects could affect traffic and transportation patterns in the area?

Note: The above questions are designed to help you look for significant relationships between things in the environment. Time may not allow you to investigate all of the suggestions. Therefore, you will have to decide which things are most significant in the time allowed. Please feel free to add to the list or change it as needed.

Something to think about. For each of the traffic and transportation routes you investigate, ask yourself:

Is it in a good location to serve its purpose?
What does it do to the environment?
What kind of an environment does it have?

3. *Summary questions on traffic and transportation survey*

See questions and discussions after TASK D.

COMMUNITY FACILITIES AND SERVICES SURVEY WORK SHEET

1. *Inventory and plot on map*

List the community facilities and services in this area.
Group these facilities and services into appropriate categories.
Label the categories.
Develop a legend for plotting this data on the map.

2. *Additional information*

DEVISE YOUR OWN METHODS TO COLLECT AND RECORD THIS DATA.

SUBMIT THE METHODS AND THE DATA, IN WRITING, TO YOUR GROUP LEADER AT THE END OF THE SESSION.

List the user groups for each category in #1 above.
What reasons can you give for the locations of each of the community facilities and services listed?
What needs of the people are being met by these facilities and services?
What needs are not being met by existing facilities and services?
What problems are associated with the quantity and quality of community facilities and services in this area?
Which of these problems are related to regional (Portland metropolitan area) environmental problems?
What proposed projects could affect the use and effectiveness of community facilities and services in this area?

Note: The above questions are designed to help you look for significant relationships between things in the environment. Time may not allow you to investigate all of the suggestions. Therefore, you will have to decide which things are most significant in the time allowed. Please feel free to add to the list or change as needed.

Something to think about. For each of the community facilities and services you investigate, ask yourself:

Is it in a good location to serve its purpose?
What does it do to the environment?
What kind of an environment does it have?

3. *Summary questions on community facilities and services*

See questions and discussions after TASK D.

ENVIRONMENTAL ASSETS AND LIABILITIES SURVEY WORK SHEET

1. *Inventory and plot on map*

List the environmental assets of the area (physical and visual).
Examples:
historic landmarks, structures with visual impact, natural features, aesthetically pleasing entrances, etc.

List the environmental liabilities of the area (physical and visual).
Examples:
conflicting land uses, heavy traffic streets, residential overcrowding, poor paving, curbs, sidewalks, adverse natural features, sameness of environment, etc.

Group the environmental assets and liabilities into appropriate categories.
Label the categories.
Develop a legend for plotting this data on the map.

2. *Additional information*

DEVISE YOUR OWN METHODS TO COLLECT AND RECORD THIS DATA. SUBMIT THE METHODS AND THE DATA, IN WRITING, TO YOUR GROUP LEADER AT THE END OF THE SESSION.

How do the environmental assets affect the rest of the area? Be specific.
How do the environmental liabilities affect the rest of the area? Be specific.
Which environmental assets have potential for serving as building blocks to improve the livability of this area?
What problems exist because of adverse environmental factors in the area?
What environmental problems in this area are related to regional (Portland metropolitan area) environmental problems?
What proposed projects could affect environmental assets and liabilities in this area?

Note: The above questions are designed to help you look for significant relationships between things in the environment. Time may not allow you to investigate all of the suggestions. Therefore, you will have to decide which things are most significant in the time allowed. Please feel free to add to the list, or change as needed.

Something to think about. For each of the environmental assets and liabilities you investigate, ask yourself:

Is it in a good location to serve its purpose?
What does it do to the environment?
What kind of an environment does it have?

3. *Summary questions on environmental assets and liabilities*

See questions and discussions after TASK D.

SOCIAL SURVEY WORK SHEET

1. *Inventory and plot on map*

Collect information about the population characteristics of the area: e.g., age, income, education, size of families, renters-owners, length of residence, etc.
Develop a legend for plotting this data on the map.

2. *Additional information*

DEVISE YOUR OWN METHODS TO COLLECT AND RECORD THIS DATA. SUBMIT THE METHODS AND THE DATA, IN WRITING, TO YOUR GROUP LEADER AT THE END OF THE SESSION.

What needs of the residents are met by living in this area?
What social problems exist in the area?
Which problems associated with this area are related to regional (Portland metropolitan area) environmental problems?
What changing conditions in the area are creating problems for its residents?
What proposed projects could:
- affect the life-style of people in this area?
- lead to a change in the population characteristics of this area?

What are the attitudes of the people in this area toward:
- governmental and private services
- citizen needs
- overall quality of life in the area? See attached opinion poll.

Note: The above questions are designed to help you look for significant relationships between things in the environment. Time may not allow you to investigate all of the suggestions. Therefore, you will have to decide which things are most significant in the time allowed. Please feel free to add to the list or change as needed.

3. *Summary questions on social survey*

See questions and discussions after TASK D.

SOCIAL SURVEY QUESTIONNAIRE

NOTE to person administering questionnaire:
Fill in the blanks with appropriate words, depending on the location and the purposes for which you are using the questionnaire.

1. I live in _____ at (cross-streets) _____.

2. Overall, _____ (shop) as a place to (live) is:

_____VERY GOOD _____QUITE GOOD _____JUST FAIR _____POOR _____VERY POOR

3. What I like best about _____ is:

4. My biggest complaint about _____ is:

5. Here's what I think should be done about that:

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